

1 1. A ureteral stent for assisting flow of urine
2 within a patient's ureter and into the patient's bladder,
3 the stent comprising a thin flexible elongated member having
4 an elongated external urine-transport surface sized and
5 configured to transport urine along the surface within the
6 ureter.

1 2. The stent of claim 1 in which the external
2 urine transporting surface is sized and configured to extend
3 along at least part of the ureter, across the ureter/bladder
4 junction, and from there through the ureteral opening into
5 the bladder.

1 3. The stent of claim 2 further comprising an
2 elongated tubular segment attached to said elongated member,
3 the tubular segment comprising:

4 a) an upper region having at least a first
5 opening,
6 b) a lower region having at least a second
7 opening to be positioned in the ureter outside the bladder,
8 and

9 c) a central lumen connecting the first
10 opening to the second opening;

11 the elongated member being at least one thin
12 flexible tail extending from the lower region of the tubular
13 segment at a point outside the bladder so as to receive
14 urine from the second opening of the tubular segment and to
15 transport urine from the second region across the
16 ureter/bladder junction and into the bladder.

1 4. The stent of claim 3 in which the upper region
2 is configured and sized for placement in the renal cavity.

1 5. The stent of claim 1 or claim 3 in which the
2 elongated member is a tail comprising at least one thread
3 filament.

1 6. The stent of claim 5 in which the tail
2 comprises multiple thread filaments.

1 7. The stent of claim 5 in which the tail
2 comprises at least one filament loop.

1 8. The stent of claim 7 in which the tail
2 comprises no unlooped filaments, so that the tail is free
3 from loose ends.

1 9. The stent of claim 7 in which the filament loop
2 comprises a junction of individual filament ends.

1 10. The stent of claim 9 in which the junction of
2 filament ends is positioned at the point where tail joins to
3 the elongated tubular segment.

1 11. The stent of claim 6, comprising at least two
2 filaments loops.

1 12. The stent of claim 3 in which the elongated
2 member is softer than the elongated tubular segment.

1 13. The stent of claim 4 in which the upper region
2 comprises a portion of enlarged diameter, designed for
3 placement in the renal cavity.

1 14. The stent of claim 13 in which the upper region
2 has an external section having straight sides and corners.

1 15. The stent of claim 5 in which the tail is a
2 fluted filament.

1 16. The stent of claim 1 further comprising an
2 extractor thread attached to the lower end of the elongated
3 member.

1 17. The stent of claim 3 in which the external
2 urine-transport surface is concave.

1 18. The stent of claim 3 in which the external
2 urine-transport surface is convex.

1 19. The stent of claim 3 in which the tubular
2 segment is stiff enough to avoid crimping during insertion
3 through the ureter.

1 20. The stent of claim 3 in which the tail and its
2 attachment to the tubular segment are strong enough to
3 permit retrieval of the stent from the kidney and ureter by
4 locating the tail in the bladder and pulling on it.

1 21. The stent of claim 3 in which the tail includes
2 an accurately shaped anchor segment to control migration up
3 the ureter.

1 22. The stent of claim 3 in which the tail is long
2 enough to effectively prevent migration of the entire tail
3 into the ureter.

1 23. The stent of claim 3 in which the tail has a
2 smaller outer diameter than the outer diameter of the
3 tubular segment.

1 24. The stent of claim 3 in which tail is solid.

1 25. The stent of claim 3 in which at least part of
2 the tail is hollow.

1 26. The stent of claim 3 in which the outer
2 diameter of the tubular segment decreases approaching the
3 bladder end region.

1 27. The stent of claim 3 or claim 26 in which the
2 tubular member includes multiple openings along its length.

1 28. The stent of claim 3 in which the outer
2 diameter of the tubular segment decreases approaching the
3 kidney end region.

1 29. The stent of claim 3 in which the kidney end
2 region includes multiple openings.

1 30. The stent of claim 3 in which the tail is
2 attached to the bladder end region at a point toward the
3 kidney with respect to the bladder end terminus of the
4 bladder end region.

1 31. The stent of claim 26 further comprising a
2 suture securing the tail to the tubular segment.

1 32. The stent of claim 31 in which the suture is
2 incorporated in the tail to impart strength to the tail.

1 33. The stent of claim 32 in which the tail
2 comprises a hollow lumen and the suture is positioned inside
3 the hollow tail lumen.

1 34. The stent of claim 33 in which the tail is
2 hollow, and the suture is attached to the tubular segment at
3 a point toward the kidney with respect to the bladder end
4 terminus of the bladder end region of the tubular segment,
5 and the suture extends toward the bladder from the point of
6 attachment through an opening in the bladder end region to
7 the central lumen of the tubular segment and from there
8 along the inside of the tail.

1 35. The stent of claim 3 in which at least the
2 bladder end region of the tubular segment comprises multiple
3 lumens, one of the lumens enclosing the suture from the
4 point of attachment to the tubular segment to the terminus
5 of the bladder end region.

1 36. The stent of claim 1 wherein the elongated
2 external urine-transport surface is a continuous surface
3 extending from the kidney to the bladder.

1 37. The stent of claim 36 wherein the elongated
2 external surface is the outer surface of a solid member
3 extending from the kidney to the bladder.

1 38. The stent of claim 3 wherein the tubular member
2 and the elongated member comprise a one-piece stent.

1 39. A method of introducing a ureteral stent into a
2 patient, the stent comprising a) a thin flexible elongated
3 member having an elongated external urine-transport surface
4 sized and configured to transport urine along the surface
5 within the ureter; and b) an elongated tubular segment
6 attached to said elongated member, the tubular segment
7 comprising: i) an upper region having at least a first
8 opening, ii) a lower region having at least a second opening
9 to be positioned in the ureter outside the bladder, and iii)
10 a central lumen connecting the first opening to the second
11 opening; the elongated member being a thin flexible tail
12 extending from the lower region of the tubular segment at a
13 point outside the bladder so as to receive urine from the
14 second opening of the tubular segment and to transport urine
15 from the second region across the ureter/bladder junction
16 and into the bladder, the method comprising:

17 (a) positioning the kidney end region of the tubular
18 segment within the renal pelvis; and
19 (b) positioning the elongated flexible member in the
20 bladder.

1 40. A method of manufacturing a ureteral stent, the
2 stent comprising a thin flexible elongated tail member
3 having an elongated external urine-transport surface sized
4 and configured to transport urine along the surface within
5 the ureter, the method comprising:
6 providing a polymer pre-form having a tubular shape,
7 forming an elongated tubular stent segment from the
8 polymer pre-form, and
9 providing a tail member at an end region of the
10 tubular segment designed to be positioned toward the
11 patient's bladder.